THE SIMILARITIES AND DIFFERENCES BETWEEN AKR AND JOVIAN DECAMETRIC EMISSIONS*

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Abstract

The observations of auroral kilometric radiation (AKR) and Jovian decametric emissions (DAM) show various similarities but also certain striking differences. The overall spectra relative to the source cyclotron frequency are similar, as are the dominant wave polarization (extraordinary) and the source location (nearly polar). For a particular instance of the Jovian emissions, it was found, just like AKR, that the source altitude decreased with increasing frequency, that the initial wave angle with respect to the magnetic field was moderately large, and that the source density was quite low. Although these similarities suggest a similar cyclotron source at both planets, the Jovian emissions, unlike AKR, are modulated by the moon Io, they seem to originate primarily in one hemisphere and at specific Jovian longitudes, rather than in both hemispheres and at certain local times, and they exhibit those curious spectral arcs versus time. Accounting for such differences, using the same basic source model, is an obvious challenge. The dominant factor, it would seem, is the need for the low background plasma density that is required by the cyclotron instability. The specific longitudes and dominant hemisphere at Jupiter might then be attributed to its magnetic anomaly raising the source to a greater altitude, where the ambient density should be less. The differences between AKR and DAM might then be attributed primarily to a localization of the Jovian source, either at the anomaly or at the foot of the Io flux tube, rather than the source being extended along an auroral zone.

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